GRADE 12 DIPLOMA EXAMINATION

Biology 30

January 1984

Alberta
EDUCATION

GRADE 12 DIPLOMA EXAMINATION
BIOLOGY 30

DESCRIPTION

Time: 2.5 hours

Total possible marks: 100

This is a **CLOSED-BOOK** examination.

GENERAL INSTRUCTIONS

There are 80 multiple-choice questions and eight written-response questions in this examination.

For multiple-choice questions, read each carefully and decide which of the choices best completes the statement or answers the question. Locate that question on the answer sheet and fill in the space that corresponds to your choice. Use an HB pencil only.

Example

This examination is for the subject area of

A. Chemistry
B. Biology
C. Physics
D. English

Answer Sheet

If you wish to change an answer, please erase your first mark completely.

For written-response questions, read carefully and write your answer in the space provided.

DO NOT FOLD EITHER THE ANSWER SHEET OR THE EXAMINATION BOOKLET.

The presiding examiner will collect the answer sheet and examination booklet for transmission to Alberta Education.

JANUARY 1984

1. The formation of fats, proteins, and polysaccharides includes the process of

   A. enzymatic hydration (hydrolysis)
   B. dehydrogenation
   C. dehydration (dehydrolysis) synthesis
   D. deamination

2. The pH of the blood is kept constant by

   A. enzymes
   B. globulins
   C. antigens
   D. buffers

3. The substance most likely found in human cells is

   A. glycogen
   B. starch
   C. cellulose
   D. lignin

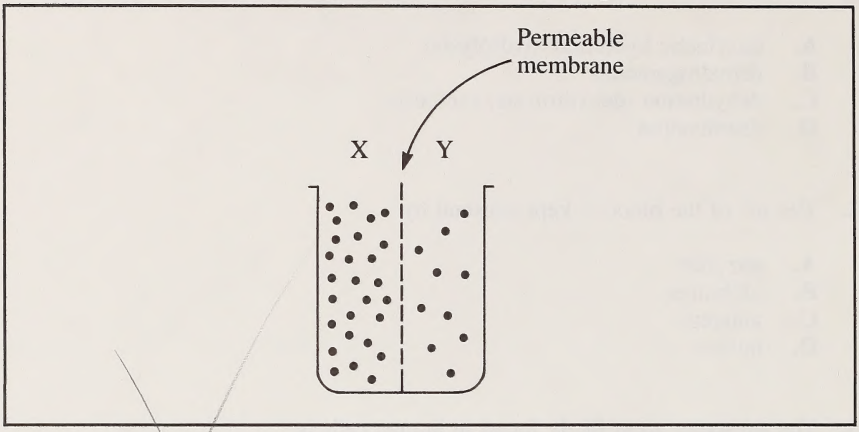
4. The essential amino acids are those that are

   A. present in all proteins
   B. necessary for enzyme formation
   C. not synthesized by humans
   D. excreted in the urine

5. Amino acids for protein synthesis in humans come from

   A. mitochondria within the cells
   B. protein breakdown in the digestive tract
   C. nuclei within the cells
   D. carbohydrate assimilation in the liver

Use the following information to answer question 6.



6. In the diagram, the particles will diffuse

A. to side X
B. in neither direction
C. in both directions
D. to side Y

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7. A red blood cell placed in a concentrated salt solution will

A. take in water by osmosis, swell, and eventually burst
B. take in water by diffusion, swell, and eventually burst
C. lose water by osmosis, shrink, and eventually die
D. lose water by diffusion, shrink, and eventually die

8. When a substance moves from an area of low concentration in a cell to an area of higher concentration,

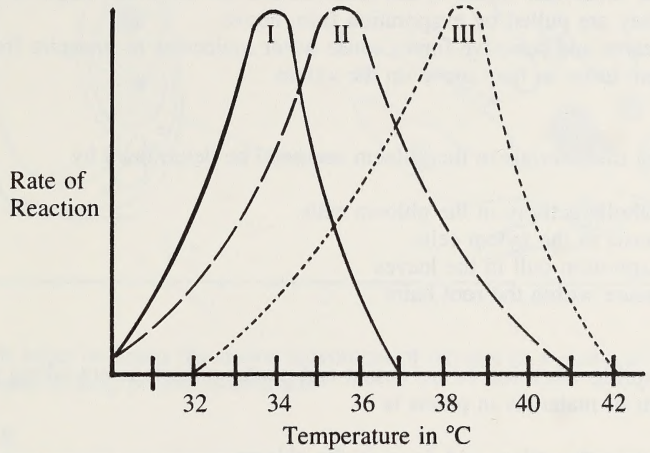
A. diffusion has occurred
B. energy is required
C. the cell will lyse
D. osmotic pressure will build up

9. White blood cells can usually control the number of *Pneumococcus* bacteria in the bloodstream by means of

A. egestion
B. endocytosis (phagocytosis)
C. exocytosis
D. transformation

Use the following information to answer question 10.

Three different enzymes, designated I, II, and III, catalyze three different reactions. The rates of the reactions were plotted against the temperature at which the reactions took place, and the following graph was produced.



10. If an organism depended on enzymes I, II, and III for one of its vital life activities, the best body temperature for that organism would be

A. 32.0°C
B. 32.8°C
C. 35.0°C
D. 38.0°C

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11. Enzymes act in chemical reactions to

A. prevent energy loss
B. lower the amount of energy required to initiate the reaction
C. increase the energy of the reactants
D. prevent the diffusion of reactants away from each other

12. A cell obtains water from an area of greater concentration of dissolved particles by

A. enzymatic reactions
B. active transport
C. diffusion
D. endocytosis

13. According to the transpiration-cohesion-tension theory,

A. osmotic pressure moves water from the soil into the root, and root pressure moves the water from the root into the stem and into the leaves
B. osmotic pressure moves water from soil to root to stem to leaves, overcoming atmospheric pressure and causing water molecules to transpire
C. water molecules in the xylem tubes cohere and are under negative pressure as they are pulled by evaporation from above
D. adhesive and cohesive forces cause water molecules to transpire from the xylem tubes as they move up the xylem

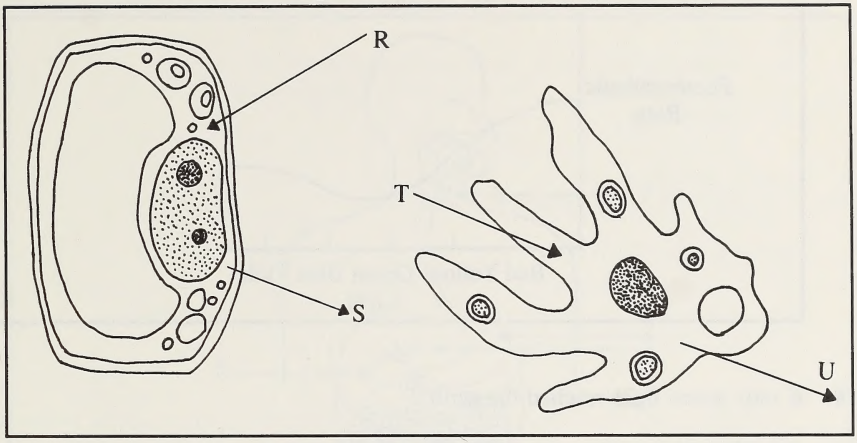
14. Movement of materials in the phloem seems to be determined by

A. metabolic activity in the phloem cells
B. osmosis in the xylem cells
C. transpiration pull in the leaves
D. pressure within the root hairs

15. In early spring when leaves are absent and photosynthesis is not taking place, the movement of materials in plants is

A. down in the xylem and down in the phloem
B. down in the xylem and up in the phloem
C. up in the xylem and up in the phloem
D. up in the xylem and down in the phloem

Use the following information to answer question 16.

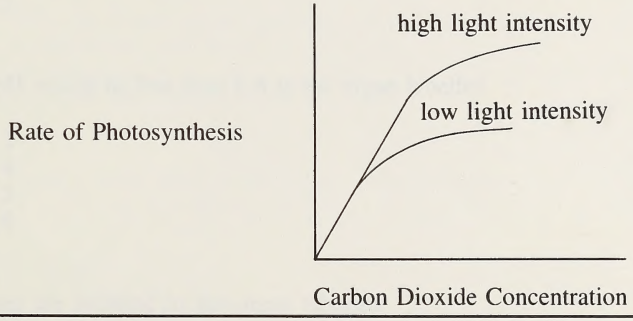


16. Which letter indicates the major movement of oxygen in a plant cell exposed to light after a long period of darkness?

A. R
B. S
C. T
D. U

Use the following information to answer question 17.

Effect of Light Intensity and Carbon Dioxide Concentration on the Rate of Photosynthesis



17. A correct conclusion one could draw from the graph is that

A. high light intensity is necessary for photosynthesis to occur
B. assimilation of carbon dioxide varies with different light intensities
C. the carbon dioxide concentration required is directly proportional to the rate of photosynthesis
D. as the rate of photosynthesis increases, the light intensity must increase

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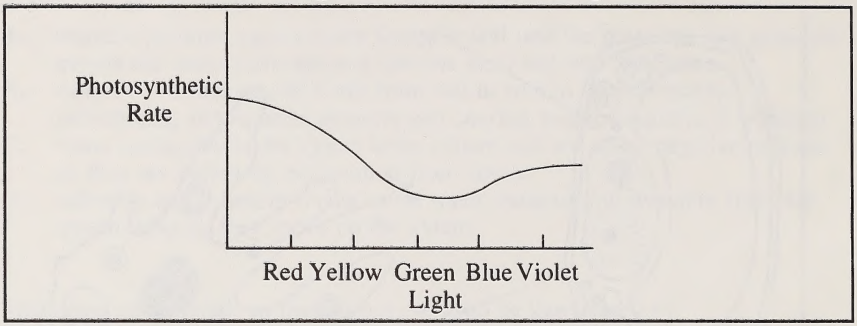
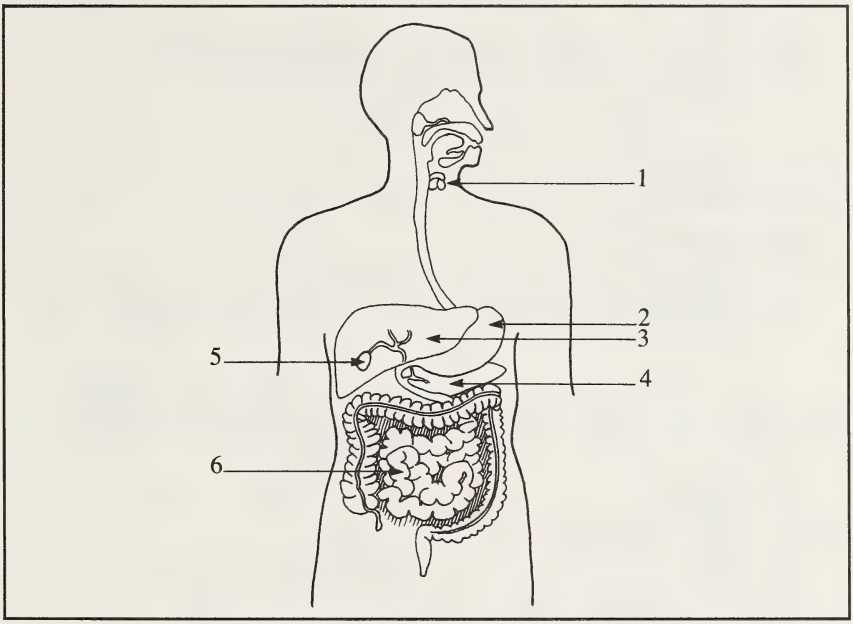
Use the following information to answer question 18.



18. If only green light reached the earth,

A. the amount of oxygen in the air would increase
B. more plants would grow
C. the amount of sugar produced by plants would increase
D. the amount of food available to animals would decrease

Use the following information to answer questions 19 to 21.



19. A person who has trouble synthesizing glycogen likely has a malfunctioning organ labelled

A. 1
B. 3
C. 4
D. 5

20. The pH would be less than 6.8 in the organ labelled

A. 2
B. 4
C. 5
D. 6

21. Lipases are secreted by the organ labelled

A. 2
B. 3
C. 4
D. 5

22. To oxidize certain compounds, chemosynthesizers require

A. light
B. inorganic nutrients
C. organic nutrients
D. amino acids

23. Bile salts aid in the digestion of fats by

A. producing lipase
B. physically breaking down fat globules
C. producing bile pigments to correct the pH level of the chyme
D. beginning chemical breakdown

24. In the small intestine, the substance MOST likely to be absorbed by active transport is

A. protein
B. salt
C. glucose
D. water

25. The unidirectional blood flow is maintained through the operation of the

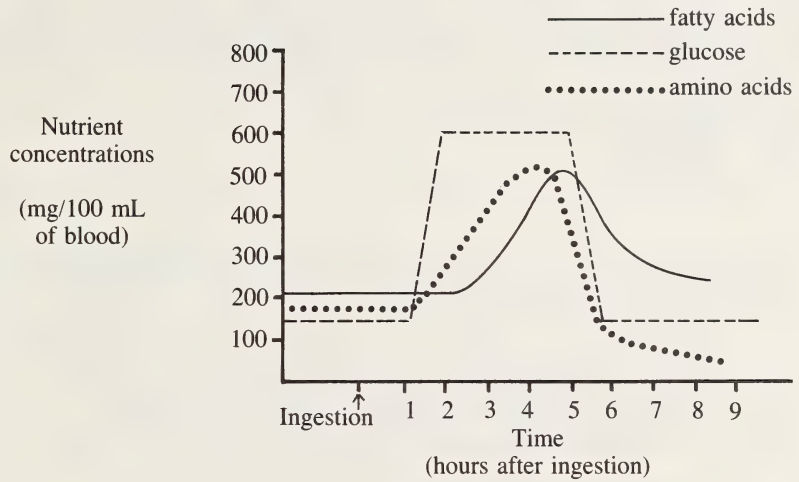
A. elasticity of the arteries
B. lymphatic ducts
C. capillary network
D. valves within veins

26. Blood in the human heart enters the pulmonary artery from the

A. left ventricle
B. right ventricle
C. right atrium
D. left atrium

Use the following information to answer questions 27 and 28.

Nutrient concentrations in the blood over an 8 h period following the ingestion of 300 g of food.



27. The most difficult materials to break down chemically (digest) and utilize as an energy source are

A. fats and sugars
B. carbohydrates and proteins
C. proteins and fats
D. proteins and carbohydrates

28. Maximum concentration in the blood of the two nutrients mentioned above occurs how long after ingestion?

A. Two hours
B. Four hours
C. Six hours
D. Eight hours

29. The blood vessel that carries oxygenated blood is the

A. vena cava
B. carotid artery
C. pulmonary artery
D. renal vein

30. The portion of the circulatory system with the largest TOTAL surface area is the

A. small veins
B. arterioles
C. capillaries
D. large arteries

31. Four individuals, W, X, Y, and Z, were interested in their blood types. Individual Z knew that he was of type O. The blood type of one of the other individuals could be determined definitely when

A. Z's serum did not clump the corpuscles in a sample of W's blood
B. X's serum clumped the corpuscles in a sample of Z's blood
C. Z's serum clumped the corpuscles in a sample of Y's blood
D. X's serum did not clump the corpuscles in a sample of W's blood

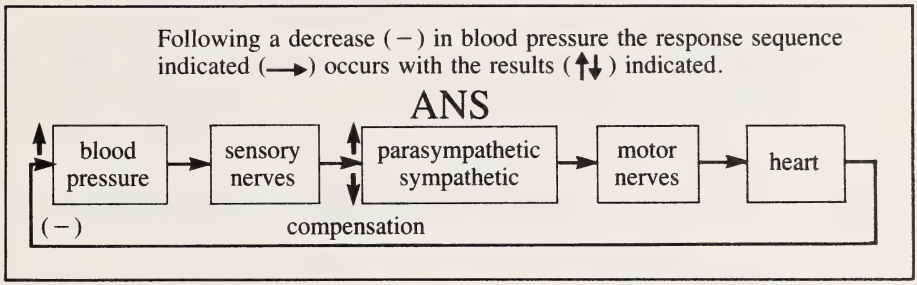
32. Valuable plasma proteins that pass from the capillaries into the body tissue are returned to the circulatory system PRIMARILY by the

A. lymphatics
B. arterioles
C. venules
D. reabsorbing capillaries of the nephron

33. Interstitial fluid re-enters the capillaries as a result of

A. a diffusion gradient
B. force filtration
C. endocytosis
D. active absorption

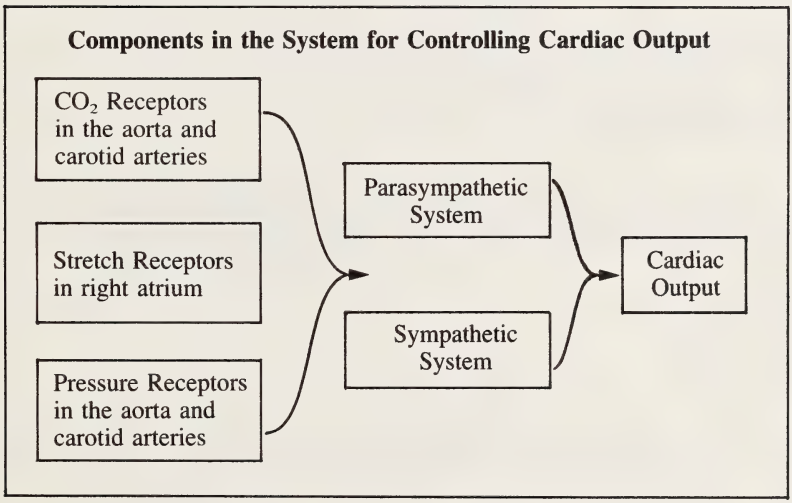
Use the following information to answer question 34.



34. According to the diagram, an increase in blood pressure will result in the heartbeat

A. remaining unchanged
B. increasing
C. decreasing
D. fluctuating

Use the following information to answer question 35.



35. Recovery after vigorous exercise will involve

A. stimulation of both the parasympathetic and the sympathetic systems
B. stimulation of the sympathetic and inhibition of the parasympathetic systems
C. inhibition of the sympathetic and stimulation of the parasympathetic systems
D. inhibition of both the parasympathetic and the sympathetic systems

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36. Increasing the rate of impulses through the parasympathetic nerve would cause

A. decreased heart rate
B. increased blood pressure
C. vasodilation in the carotid arteries
D. increased blood flow into the vena cava

37. The systems of the human that are directly responsible for breathing are the

A. nervous and digestive
B. muscular and skeletal
C. endocrine and skeletal
D. skeletal and excretory

38. The actions that cause one to inhale are

A. contraction of the diaphragm and lifting of the rib cage
B. contraction of the diaphragm and dropping of the rib cage
C. relaxation of the diaphragm and dropping of the rib cage
D. relaxation of the diaphragm and lifting of the rib cage

39. Diffusion of carbon dioxide from the capillaries to the alveoli and of oxygen from the alveoli to the capillaries is due to a high concentration of

A. capillary carbon dioxide and alveolar oxygen
B. alveolar carbon dioxide and low capillary oxygen
C. alveolar carbon dioxide
D. capillary oxygen

40. A cancerous growth occurs in a bronchiole causing blockage. The part of the body with an inadequate oxygen supply would be the

A. bronchus
B. alveolus
C. glottis
D. larynx

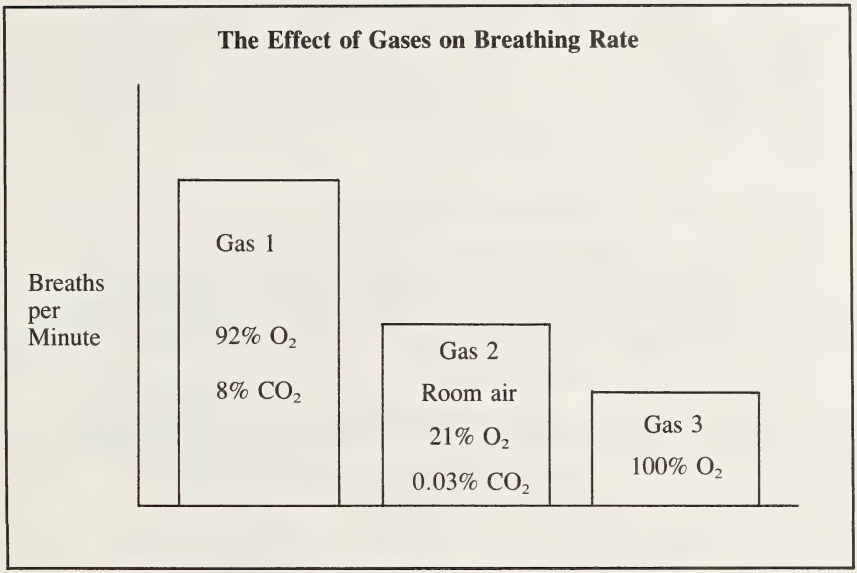
41. A decrease in the breathing rate is an indication of

A. muscular exertion
B. increased adrenalin levels
C. high blood CO_2 levels
D. low blood CO_2 levels

42. The area of the brain that controls the rate and depth of breathing is the

A. cerebrum
B. medulla oblongata
C. cerebellum
D. hypothalamus

Use the following information to answer question 43.



43. The breathing rate is regulated by the

A. concentration of oxygen
B. concentration of carbon dioxide
C. temperature of the gas
D. volume of the gas

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44. The breathing rate of a runner who finishes a 3000 m race remains quite high for a period of time. This rapid rate is because of

A. the oxygen debt
B. hyperventilation
C. carbon dioxide deprivation
D. the accumulation of pyruvic acid

45. The energy-rich molecule in the cell is formed by the conversion of

A. RNA to DNA
B. glucose to starch
C. ADP to ATP
D. PGA to PGAL

46. During metabolism, glucose molecules are activated by

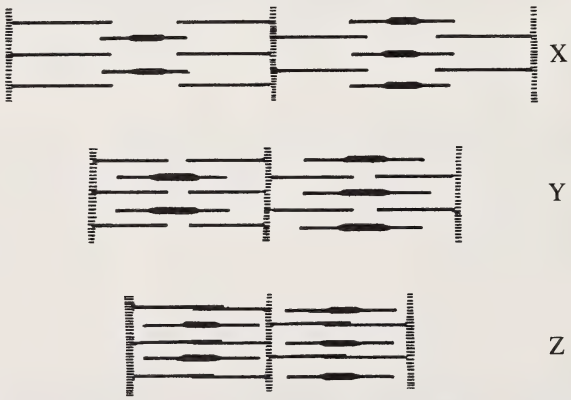
A. lactic acid
B. oxygen
C. nucleotides
D. ATP

47. When a muscle becomes fatigued, there is

A. much lactic acid, much ATP, and much glycogen in the muscle
B. little lactic acid, little ATP, and much glycogen in the muscle
C. little or no ATP, little glycogen, and much lactic acid in the muscle
D. no glycogen, little lactic acid, and much ATP in the muscle

Use the following information to answer question 48.

Protein Filaments in a Muscle Fibre



48. The correct illustration(s) of fully contracted muscle filaments

A. is diagram X
B. is diagram Y
C. is diagram Z
D. are diagrams X, Y, and Z

49. Which of the following acts as a phosphate donor in respiration?

A. Cytochrome
B. Lactic acid
C. ADP
D. ATP

50. ATP would be expended during the elimination of

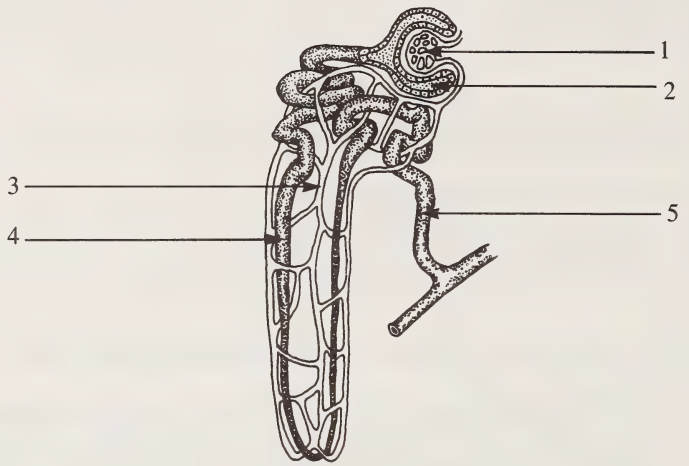
A. water, against the osmotic gradient
B. glucose from a hypertonic solution
C. chlorine ions from a hypertonic solution
D. sodium, in the direction of the diffusion gradient

51. In the resting nerve cell, the outside of the cell membrane is

A. positive, and the sodium ion concentration is greater on the outside than in the cytoplasm
B. negative, and the sodium ion concentration is greater on the outside than in the cytoplasm
C. positive, and the sodium ion concentration is greater on the outside than in the extracellular fluid
D. negative, and the sodium ion concentration is greater on the outside than in the extracellular fluid

Use the following information to answer questions 52 to 54.

A Nephron



52. Filtration of blood plasma occurs between the areas labelled

A. 1 and 2
B. 2 and 4
C. 3 and 4
D. 4 and 5

53. Reabsorption of glucose occurs from the area labelled

A. 2
B. 3
C. 4
D. 5

54. The concentration of urea is greatest in the area labelled

A. 2
B. 3
C. 4
D. 5

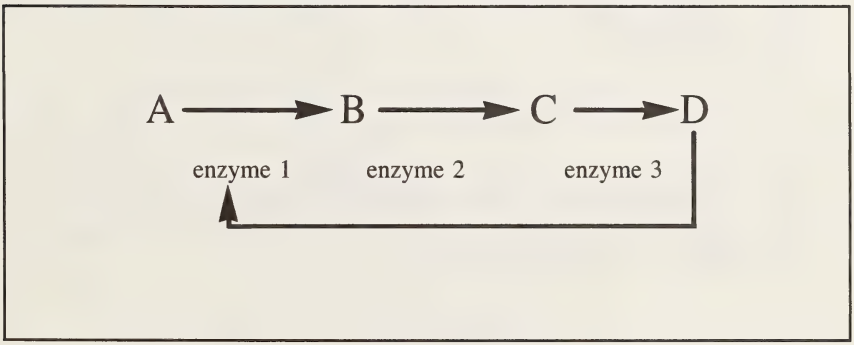
55. The two major functions performed by the kidneys are

A. regulation of bile secretion and excretion of the waste products of metabolism
B. excretion of the waste products of metabolism and regulation of elimination from the digestive tract
C. control of the concentration of most constituents of body fluids and excretion of the waste products of metabolism
D. excretion of the waste products of metabolism and regulation of the substances used in the digestive processes

56. A build-up of water in the blood will result in

A. decreased production of anti-diuretic hormone by the body
B. decreased urine formation by the kidneys
C. increased activity by osmoreceptors
D. decreased blood pressure maintaining homeostasis

Use the following information to answer question 57.



57. If the level of D in the cell is controlled by feedback inhibition (negative feedback), the effect of high concentrations of D in the cell would be to

A. stimulate the conversion of substance A to B
B. inhibit the conversion of substance A to B
C. stimulate the conversion of substance B to C
D. inhibit the conversion of substance B to C

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58. Which of the following is NOT an endocrine gland?

A. Adrenal gland
B. Spleen
C. Testes
D. Pituitary

59. Some fruits are harvested in the ''green'' stage, but before they reach the market, they ripen to an acceptable color. Ripening of the fruit is caused by

A. high temperatures
B. small amounts of ethylene
C. small amounts of gibberellin
D. darkness

60. Flowering in plants is triggered by

A. phototropism and temperature
B. photoperiodism and abscisic acid (abscisin)
C. photoperiodism and temperature
D. phototropism and abscisic acid (abscisin)

61. A root growing into the ground is an example of

A. hydrotropism
B. geotropism
C. thigmotropism
D. chemotropism

62. Positive phototropism is usually the result of the

A. rapid growth of cells on the lighted side of a stem
B. dehydration of cells on the dark side of a stem
C. effects of light on auxins
D. attraction of chloroplasts to light

63. An example of negative feedback would be the process by which

A. nerves stimulate glands to produce hormones
B. the accumulation of a hormone in the blood inhibits further production of that hormone
C. the production of hormones is regulated by the autonomic nervous system
D. unnecessary hormones are absorbed back into the gland that produced them

64. The pituitary is a major endocrine gland because it

A. is located at the base of the brain and receives impulses directly from the cerebrum
B. is the largest gland in the body
C. produces hormones that influence the activities of the other glands in the body
D. directly controls every other gland and organ in the body

65. Under conditions of injury, fright, or stress, the body's response is to release

A. insulin
B. progesterone
C. secretin
D. ADH

66. A gland that secretes BOTH an enzyme and a hormone is the

A. thyroid
B. liver
C. pancreas
D. pituitary

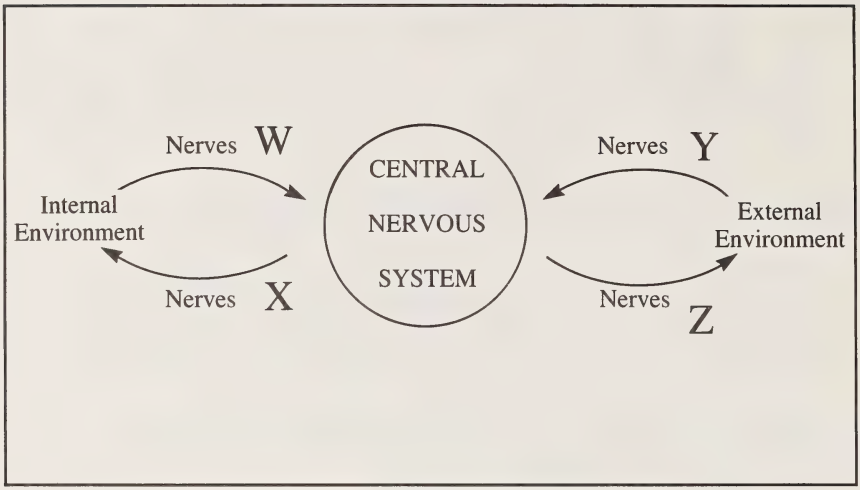
67. Sometimes thyroxin is used in treating overweight persons because it

A. decreases the appetite
B. accelerates the conversion of glucose to glycogen
C. inhibits the conversion of fatty acids and glycerol to fat
D. increases the metabolic rate

68. The three hormones directly involved in glucose metabolism are

A. thyroxin, adrenalin, and insulin
B. insulin, aldosterone, and estrogen
C. thyroxin, adrenalin, and aldosterone
D. testosterone, thyroxin, and ADH

Use the following information to answer question 69.



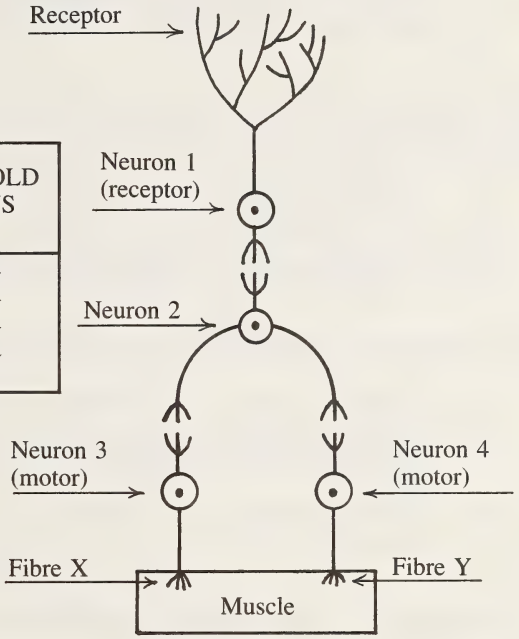
69. The autonomic nervous system is shown by

A. W and Y
B. Y and Z
C. X and Z
D. W and X

Use the following information to answer questions 70 and 71.

The diagram shows a system of neurons, each of which has a different threshold of stimulation.

NEURON NUMBER	THRESHOLD STIMULUS in volts
1	0.05 V
2	0.13 V
3	0.18 V
4	0.23 V



70. The stimulus that would create an impulse in neuron 1 ONLY is

A. 0.24 V
B. 0.19 V
C. 0.15 V
D. 0.09 V

71. The minimum stimulus required for contraction of neurons 3 and 4 is

A. 0.13 V
B. 0.18 V
C. 0.23 V
D. 0.41 V

72. With reference to the structure of the human eye, which of the following is a TRUE statement?

A. The lens regulates the amount of light reaching the retina.
B. The rods are involved in color vision.
C. There is a blind spot where the optic nerve joins the retina.
D. The choroid is the outer coat of the eye.

73. A destruction of hair-like projections on the floor of the cochlear duct (organ of Corti) would most likely be associated with

A. frequent and drastic changes in air pressure
B. equilibrium malfunctions of the inner ear
C. intense high and low frequency sounds
D. the destruction of the ossicles of the middle ear

74. The pathway followed by the sperm on the way to the egg is

A. seminiferous tubules — vas deferens — urethra — vagina — oviduct
B. seminiferous tubules — seminal vesicles — urethra — oviduct — vagina
C. seminiferous tubules — vas deferens — seminal vesicles — urethra — vagina
D. seminiferous tubules — vas deferens — Cowper's gland — urethra — oviduct

75. Sterilization of adult mammals is a procedure that

A. affects the secondary sex characteristics
B. renders the individual incapable of reproduction
C. is readily reversible
D. has a direct effect on hormone production in the thyroid

76. Until the age of puberty, there is no testosterone secreted in the male owing to the lack of a

A. thyroid hormone
B. pituitary hormone
C. adrenal hormone
D. parathyroid hormone

77. Hormone production by the ovaries is not necessary during the later months of pregnancy because hormones are also produced by the

A. corpus luteum
B. gonads
C. amnion
D. placenta

78. An extremely high concentration of progesterone is administered to a woman on the 17th day of a 28-day menstrual cycle. The high concentration of progesterone would very quickly promote

A. ovulation on the 18th day of the menstrual cycle
B. deterioration of the corpus luteum and then menstruation
C. rapid follicle development (in the ovaries)
D. pregnancy

79. In an ectopic pregnancy, the fertilized egg becomes implanted prematurely in the fallopian tube. The ectopic pregnancy becomes life-threatening for the developing fetus because

A. only the fallopian tubes produce LH, which is needed to maintain pregnancy
B. the fallopian tube is so elastic and flexible that it promotes premature labor
C. the fallopian tube contains a much thinner layer of endometrium than the uterus, and therefore fewer nutrients for the fetus
D. FSH and estrogen, which control fetal development, are produced in the fallopian tubes

80. The outermost membrane of the developing fetus is referred to as the

A. amnion
B. endometrion
C. chorion
D. embryion

THANK YOU FOR COMPLETING THE MULTIPLE-CHOICE SECTION OF THE EXAMINATION.
PLEASE PROCEED TO THE NEXT PAGE AND ANSWER THE WRITTEN-RESPONSE QUESTIONS IN PART B.

PART B

WRITTEN RESPONSE

INSTRUCTIONS

Please write your answers in the examination booklet as neatly as possible.

1. In a biological experiment, a piece of chewed unsweetened cracker is placed in a test tube and incubated at body temperature for five minutes. At the conclusion of this period, Fehling's or Benedict's solution is added and the contents are heated.

   State ONE observation and ONE conclusion that could be made concerning the experiment.

(3 marks)

2. List THREE differences between photosynthesis and respiration as biochemical reactions.

(3 marks)

3. **a.** Diabetes mellitus (sugar diabetes) is characterized by the following symptoms:

I increased daily urine output
II thirst
III lack of energy

Explain the causes of the symptoms as they relate to diabetes mellitus.

(2 marks)

b. Explain ONE procedure used to control this disease.

(1 mark)

4. **a.** During an allergic reaction, histamines are released into the blood causing capillaries to become permeable to plasma proteins. Explain why tissue swelling accompanies such a reaction.

(2 marks)

b. Explain why an injection of an antihistamine may help to reduce this swelling.

(1 mark)

In an experiment that tested the effect of enzymes on food substances, students noted the following:

	Observation
boiled egg-white + HCl	no reaction
boiled egg-white + HCl + pepsin	digested egg-white
boiled egg-white + HCl + pepsin + unknown (x)	no reaction

	Observation
meat + HCl	no reaction
meat + HCl + pepsin	digested meat
meat + HCl + pepsin + unknown (x)	no reaction

Note: Unknown (x) does not change the pH.

5. From the experimental results above, predict the effect of unknown (*x*) on pepsin.

_____

_____

(2 marks) _____

_____

6. Some insecticides inhibit the action of the enzyme acetylcholinesterase (cholinesterase). Explain how such insecticides would kill insects.

_____

_____

(2 marks) _____

_____

_____

7. If an axon is sufficiently stimulated some distance from its end, an impulse travels in both directions from the site of stimulation. Explain why impulses travel in ONE direction only in neural circuits.

(2 marks)

8. A sailor lost at sea drinks sea water as a means of replenishing the body fluids lost through sweating and breathing. (Body tissues are 4% salt, while the sea has a 7% salt concentration.) State in physiological terms whether drinking sea water will help the sailor.

(2 marks)

YOU HAVE NOW COMPLETED THE EXAMINATION. IF YOU HAVE TIME, YOU MAY WISH TO GO BACK AND CHECK YOUR ANSWERS.

FOR DEPARTMENT USE ONLY

M1 M2 M3

FOR DEPARTMENT USE ONLY

(LAST NAME) (FIRST NAME)

NAME:

Y M D

DATE OF BIRTH: SEX:

SCHOOL CODE: SCHOOL: _____

CITY: _____

SIGNATURE: _____

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